



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/707,648

11/07/2000

Rohit Patnaik

99,868-C

9343

20306

7590

07/14/2004

MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

EXAMINER

AHMED, SAMIR ANWAR

ART UNIT

PAPER NUMBER

2623

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/707,648

Applicant(s)

PATNAIK, ROHIT

Examiner

Samir A. Ahmed

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☒ Claim(s) 7 and 8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>5</u> . | 6) <input type="checkbox"/> Other: _____ |

1. Applicant's election without traverse of claims 1-8 in the reply filed on 2/23/04 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Rooks (U.S. Patent 5,719,952).

As to claim 1, Rooks discloses a method for inspecting a BGA joint, comprising the steps of:

finding a location of the BGA joint [the centroids of the solder balls are located using CAD data as a first estimate which is subsequently refined by the technique described herein (col. 7, lines 30-55)];

improving the location using a fine locator [the centroids location is refined using rectangular operator 40 (see Fig. 8C)] ;

measuring, in a slice image, a plurality of diameters through the BGA joint at predetermined angles [the centroids are located in a cross sectional slice 100 shown in Fig. 7 and the average joint diameter is measured at both pad and package slices (plurality of diameters) (col. 7, lines 1-6), the BGA slice images are laminographic with angles of respectively 28 and 26 degrees (predetermined angles) (col. 4, lines 26-41)];
and

applying a rule to compare the measured diameters to an expected diameter [the average diameters of the solder-fillet contour are compared to their thresholds (expected diameter) (col. 10, lines 16-19)] .

As to claim 2, Rooks further disclose, wherein the plurality of diameters are measured at the located center of the BGA joint (col. 9, lines 48-60, Fig. 11).

As to claim 3, Rooks further disclose, wherein the step of finding the location of the BGA joint comprises applying a centroid-based rough locator to the slice image [the centroids of the solder balls are located using a first estimate (rough locator) which is subsequently refined by the technique described herein (col. 7, lines 30-55)].

As to claim 4, Rooks further discloses, wherein the fine locator comprises:
applying a plurality of locator windows over the BGA joint [rectangular operator 40 (locator windows) (Fig.8C)];

locating two ball edges within a locator window [spokes 38 edge detection to locate the ball edge (see Figs 8b and 11), it is clear in Fig, 8c that inner region 44 of the locator defines four ball edge points]; and

determining a midpoint between the two ball edges (col.9, lines 48-55).

As to claim 5, Rooks further discloses, wherein locating two ball edges within a locator window comprises applying a derivative edge finder on either side of the BGA joint [spokes 38 edge detection to locate the ball edge (see Figs 8b and 11) is a derivative edge finder that locates the ball edge].

As to claim 6, Rooks further discloses, wherein the step of locating two ball edges within the locator window is repeated for each of the plurality of locator windows (See Figs 8b and 8c).

Allowable Subject Matter

4. Claims 7-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to claim 7, the limitation, wherein the rule comprises calculating a sum in the form of:

$$\Sigma (D-d[i])$$

where D is an expected diameter and d[i] are the measured diameters, is not disclosed or suggested by the prior art of record.

Claim 8 depends from claim 7.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samir A. Ahmed whose telephone number is 703-305-9870. The examiner can normally be reached on Mon-Fri 8:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2623.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SA



SAMIR AHMED
PRIMARY EXAMINER